ASSESSMENT OF FACTORS AFFECTING RICE (*ORYZA SPP.*) VALUE CHAIN (RVC) IN OGUN AND NIGER STATES, NIGERIA

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ABSTRACT: *The need to increasing rice productivity, value addition and acceptability through the rice value chain are some of the objectives of Federal Government of Nigeria in recent time. Rice is a major staple food in Nigeria. Rice production is however low which make the country to be a net importer of rice in Africa. This study was carried out to assess factors affecting rice (Oryza spp.) value chain in Ogun and Niger States, Nigeria. Multistage sampling techniques were used in the selection of 320 respondents for this study. Data collected were analyzed with chi square. Results of this research showed that more than forty percent of the respondents were between 30 – 40 years of age, predominantly male (80.3%), married (83.1%), had relatively large household size (6 people) and formal education (80.6%). Average income generated was estimated as ₦551,250/ha. They were member of Cooperative societies (66.6%), FADAMA (23.4%) and RIFAN (10%). More respondents (60%) carried out soil test and used tractor for land clearing in Niger State than in Ogun State (11.9%). Rice seeds were mostly planted on the field nursery (90%) rather than tray nursery (10%) using broadcasting method (84.4%). Hired and family labour (58.2%) was used for rice value chain in the two sampled states. Also, most operations in the rice processing were carried out manually (100%) due to non-availability of basic rice processing facilities. Marketing of rice was usually done at local markets (98.3%) at interval of 5-day marketing (72.2%) and mudu/congo (69.1%) was the item used for measurement in the market. Moreover, the returns of value addition were higher at marketing stage (₦750/kg in Ogun State and ₦550/kg in Niger State) than production stage (₦350/kg in Ogun State and ₦280/kg in Niger State). Birds' disturbance (96.6%), high cost of processing equipment (92.5%), inadequate finance (83.1%) and lack of rural infrastructure (82.8%) were the major constraints to rice value chain in the sampled states. Chi- square analysis shows that there is significant relationship between socio-economic characteristics of the respondents and value addition at p < 0.05 level of significance. Similarly, significant relationship existed between threshing ($\chi^2 = 8.35$, df = 1, p = 0.00) and rice value addition at p < 0.05 level of significance. The study therefore recommends that rice farmers should embark on value addition to enhance their income from rice production.*

KEYWORDS: Assessment, Factors, Rice, Value Chain, Ogun, Niger

INTRODUCTION

Background of the study

Increasing rice productivity and acceptability, enhancing better marketing, poverty alleviation and increasing value addition of rice through the rice value chain are some of the major targets of Nigeria government over the years. Value chain is the full range of activities

required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers and final disposal after use (Kaplinsky and Morris 2001). Production, processing, marketing, and consumption of rice are moving towards high-value food products. In response, food production portfolio is diversifying. These changes are creating opportunities as well as challenges in production and marketing dynamics (Birthal *et al.,* 2007). Nigeria has been a major consumer and importer of rice in Africa. Indeed, rice is classified among the top four agriculture imports in Nigeria along with wheat, sugar and fish. It has been reported that the country spends over ₦356 billion on yearly importation of rice, out of which about ₦1 billion is used per day (Akinwunmi, 2012 cited in Oyediran, 2016). It is the most important cereal after wheat and it is widely consumed in one form or the other (Omoare, 2016). Rice production is however declining despite the fact that Nigeria has ecologies that favour rain-fed lowland, irrigated lowland as well as upland rice production. Production is dominated by smallholder farmers who use rudimentary technology and traditional method in producing over 80% of our national production. Rice grows very well in almost every part of the country (Sanni *et al*., 2005 cited in Omoare, 2016). For the past one decade Nigeria has been a net importer of rice, which had also adversely affected local production tantamount to the enrichment of few rich people involved in the rice importation. Rice importation is seen as a waste of foreign exchange based on the comparative advantage of the country in rice production and the cost of these rice imports represents a significant amount of lost earnings for the country in terms of jobs and income (Oyediran, 2016). Despite the increase in awareness of the importance of rice value addition to human consumption and industrial need, for the last decade, Nigeria government has not been able to increase and improve its local rice production thereby the country depends heavily on rice importation. Yet, there has been stupendous rice consumption in Nigeria since the 1970s and creating a substantial surge in rice imports since then, making rice a political commodity in the country. On one side, rice became a critical component of the Nigerian household diet and on the other side, a major consumer of the country's foreign exchange. It is indeed lamentable for a country such as Nigeria with huge human and natural resources (land and water), including capital has continued to bear the burden of unbearable pain of rice importation for many decades following huge capital flight and increasing unemployment (Akinwunmi, 2013).

The quality of the local rice has been a major issue in an effort to develop local rice acceptability and consumption among Nigerians. Rice quality and standardization are not yet well developed in Nigeria because rice processing and milling are still primarily conducted at the cottage level (WARDA, 2003). The processing sub-sector is highly fragmented and offers no standard for quality of product. Rice passes through a number of stages at which value is added before reaching the final consumers hence, sustainability of rice value chain (RVC) of Ogun and Niger States was studied to identify opportunities for growth in the RVC with emphasis on determining the potential for generating additional livelihoods for the poor and lowincome groups. This study thereby becomes necessary to assess factors affecting rice value chain, determine the cost benefit of value addition and identify the most profitable (stage) of the chain with a view to proffer recommendations on strategies to adopt improved production, processing and marketing practices to ensure availability of quality local rice and its distribution for consumption in the study areas and Nigeria at large.

The specific objectives are to:

1. describe the socio-economic characteristics of the respondents of the actors in the value chain and the various varieties of rice cultivated in the study areas

2. examine production patterns of rice in the study areas

3. assess the processing techniques for rice in the study areas

4. examine the marketing systems for rice in the study areas

5. estimate value added income at various stages of rice value chain in the study areas

6. identify the challenges confronting rice value chain in the study areas

Hypotheses of the Study

H_{01}: There are no significant relationships between the socio-economic characteristics of the respondents and rice value addition.

H_{02}: There are no significant relationships between processing techniques and rice value addition.

RESEARCH METHODOLOGY

This study was carried out in Ogun and Niger States Nigeria.

Ogun State

Ogun State is one of the six States in the south west Nigeria. The state was created in February 3rd, 1976. It is bounded in the west by Republic of Benin, bounded in the south by Lagos State and Atlantic Ocean, in the North by both Oyo and Osun States and in the East by Ondo State. The State lies between the latitudes $7^0$18'N and longitude $5^0$55'E. It is situated within the tropics covering 16,409.29km^2 with a population of about 4,054,272 (National Population Commission (NPC), 2006). The State has bimodal rainfall pattern which reaches its peak in July and September and it comprises of mostly agrarian communities which engages the farming activities of both males and females, in cash crops and food crops in order to meet the livelihood needs of the farmer, in addition to their foreign exchange. Most of the crops grown in Ogun State include cassava, rice, maize, melon, cotton, cocoyam, cocoa, yam, cowpea etc. Agriculture in Ogun State is more on crops, while the livestock raised is supplementary.

Niger State

Niger State is one of the six States in North Central Nigeria, and its population was 4,082,558 (National Population Census (NPC), 2006). The state was created in 1976 with its capital in Minna. The state was named after River Niger. It is located between latitudes 8°20′N and 11°30′N and longitudes 3°30′E and 7°20′E. Currently, the state covers a total land area of 76,000km^2 (about 9 percent of Nigeria's total land area). This makes it the largest state in the country (Community Portal of Nigeria, 2003). By reason of its location and its climate, soil, and hydrology, Niger State has the capacity to produce most of Nigeria's staple crops such as

maize, sorghum, rice, yam, pepper and melon. Agriculture is the back bone of the economy of Niger State as nearly 90 percent of the population depends either directly or indirectly on it for their livelihood.

Sampling technique and data collection method

Multistage sampling techniques were used in the selection of 320 respondents for this study. The first stage was purposive selection of two rice producing Local Government Areas each from Ogun and Niger States respectively. This gave rise to 4 Local Government Areas, namely: Yewa North and Obafemi-Owode Local Government Areas in Ogun State and Lavun and Gbako Local Government Areas in Niger State. The second stage involved the selection of 2 rice farming communities each from the 4 selected rice producing Local Government Area from the 2 States, this gave rise to 8 communities namely Eegua, Igbogila, Obafe, Ofada in Ogun State, while Ebba, Baddegi, Lemu Kataeregi in Niger State. In the third stage, simple random sampling technique was used to select 40 registered rice farmers each in Ogun and Niger States for Growth Enhancement Support Scheme (GESS). This gave rise to a total of 320 rice famers as the sample size for this study. Data for this study were collected through the use of a well-structured interview guide in addition to Focus Group Discussions (FGD) with rice farmers in the study area. The exercise was carried out with the assistance of OGADEP and Niger state ADP field officers and also the executive members of Rice farmers association, who helped to locate farm locations. The instrument was subjected to face validity involving supervisors' assessment, experts in Agricultural Extension and Rural Development and Agricultural Administration Department, their criticisms and suggestions were positively utilized for a more valid instrument.

The reliability test for the instrument was conducted using test re-test method. Administration of the instrument was done for 40 rice farmers (20 farmers in each state) who were not included in the actual study sample at two weeks interval. Scores were assigned to the responses of the selected respondents. Total scores for each period were computed and Pearson Product Moment Correlation (PPMC) was used to determine the relationship between the two set of scores. The instrument was considered reliable with a reliability coefficient of 0.75 and above obtained.

Measurement of variables and method of data analysis

Age, household size, monthly income, farmers experience and farm size were measured at ratio level while gender, marital status, educational attainment, farming status and membership of association were measured at nominal level. Also, soil test, land clearing, planting method and farm labour services were measured at nominal level but cost of agri-inputs were measured at ratio level. Weed and birds control were nominally measured. Harvested was measured in tonnes/ha while sales was measured in ₦/ha at ratio level. Processing and marketing systems and constraints were also nominally measured. Data obtained were analyzed with both descriptive statistics and chi-square.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The results in Table 1 showed that 47.2% of the respondents were between 30 – 40 years of age, 37.2% were 41 – 50 years and 15.6% were above 51 years of age. The average age of the respondents was 42.2 years. Meanwhile the proportion of the respondents that was between 30 – 40 years of age was higher in Ogun State (50.6%) compared to Niger State (43.7%). This is an indication that most of the rice farmers are within the economically active part of population and therefore constitute a good labour force for rice value chain with the ability to cope with rigors associated farming activities in rural areas of Nigeria. These results agreed with the previous findings of Theodora (2005), Omoare (2015) and Oyediran (2016) that people who are young are more agile, prone to risk taking than the old, hence they are innovative. Most (80.3%) of the respondents were male while 19.7% were female. This indicates the dominance of male in rice farming in the study areas. Ogun State has the higher proportion of male (82.5%) in the rice value chain compared to Niger State (78.1%). But, 21.9% female in Niger State engaged in rice value chain as against 17.5% in Ogun State. About 83.1% of the respondents were married across the sampled states, with 75% respondents from Ogun State married and 91.2% in Niger State were married. Niger State has the higher proportion of married among the respondents in the two states. This is expected going by the early marriage practice in the northern part of Nigeria compared to southern part of the country. Marriage has been reported to confer some level of responsibility on individuals that are involved like provision of food items, clothing and for the household (Omoare *et al*. (2015); Oyediran *et al*. (2016). On the other hand, 11.9% of the respondents were divorced and 5.0% were single. Above half (51.9%) of the respondents had 4 - 6 people in their households while 48.1% had more than 7 people in their households. This is an indication that the household size was relatively large. The average household size was 7 people. The household size of majority (60.6%) of the respondents in Niger State was very high compared to Ogun State (35.6%). Ebewore (2013) cited in Oyediran (2017) asserted that household size is an important index in any rural development intervention which can affect the outcome of such intervention. A large proportion (80.6%) of the respondents had formal education out of which 26.6% had primary education, 36.6% had secondary education and 17.5% had tertiary education. This is an indication that rice farmers in the sampled states are literates. Respondents that had secondary (45%) and tertiary education (23.8%) in Ogun State were higher than that of Niger State (28.1% for secondary and 11.2% for tertiary). Meanwhile, there were about 19.4% that did not have formal education in the sampled states. Income generated by 32.8% of the respondents was more than ₦601,000/ha with respondents from Niger State having higher income (40%) compared to Ogun State (25.6%). On the other hand, 29.4% of the respondents from Ogun State generated ₦300,000 – 400,000/ha compared to 15% from Niger State that generated similar amount. The average income realized was ₦551,250/ha across the sampled states. It implies that the respondents realized huge amount of money from rice value chain and this will go a long way to cater for the needs of the rice farmers in the study areas. Also, the results revealed that 53.4% of the respondents had spent more than 20 years in rice value chain, 36.6% had spent 11 – 20 years and 10% had spent less than 10 years rice value chain activities in the study areas. The mean year of experience in rice production was 17.9 years. Niger State had the higher proportion of highly experienced rice farmers (57.5%) who had spent more than 20 years in rice value chain compared to 49.4% in Ogun State. Years of farming experience usually play a vital role in any farming enterprise (Abiona, 2010). Results further showed that 72.2% of the respondents cultivated 6

– 10 ha of land for the rice production while the remaining 27.8% planted rice on less than 5 ha of land. Most of the respondents (80.6%) from Niger State cultivated 6 – 10 ha compared to 63.7% in Ogun State that cultivated same hectarage. It is an indication that rice farmers operated on a small to medium scale. This agrees with the findings of Sodiya and Oyediran (2014) that most rural farmers operate at subsistence level in Nigeria. Most (88.4%) of the respondents are full-time farmers with respondents in Niger State constituted 95.6% and Ogun State was 81.3%. the remaining 11.6% were part-time rice farmers in the sampled states.

Table 1: Distribution based on socio-economic characteristics of the respondents (n = 320)

Variables	Ogun (n=160)	Niger (n=160)	Total (n=320)	Mean	Std. Dev.
Age (years)					
31 – 40	81(50.6)	70(43.7)	151(47.2)	42.2	7.7
41 – 50	57(35.6)	62(38.8)	119(37.2)		
51 and above	22(13.8)	28(17.5)	50(15.6)		
Gender					
Male	132(82.5)	125(78.1)	257(80.3)		
Female	28(17.5)	35(21.9)	63(19.7)		
Marital status					
Single	11(6.9)	05(3.1)	16(5.0)		
Married	120(75.0)	146(91.2)	266(83.1)		
Separated/Divorced	29(18.1)	09(5.6)	38(11.9)		
Household size (people)					
4 – 6	103(64.4)	63(39.4)	166(51.9)	6	2
7 and above	57(35.6)	97(60.6)	154(48.1)		
Educational attainment					
No formal education	20(12.5)	42(26.3)	62(19.4)		
Primary education	30(18.7)	55(34.4)	85(26.6)		
Secondary education	72(45.0)	45(28.1)	117(36.6)		
Tertiary education	38(23.8)	18(11.2)	56(17.5)		
Farmers' monthly income (₦)					
300,000 – 400,000	47(29.4)	24(15.0)	71(22.2)		
401,000 – 500,000	40(25.0)	35(21.9)	75(23.4)		
501,000 – 600,000	32(20.0)	37(23.1)	69(21.6)	551,250	137,368
601,000 and above	41(25.6)	64(40.0)	105(32.8)		
Years of experience					
Less than or equal 10	20(12.5)	12(7.5)	32(10.0)		
11 – 20	61(38.1)	56(35.0)	117(36.6)	17.9	8.4
21 and above	79(49.4)	92(57.5)	171(53.4)		
Farm size (ha)					
Less than 5	58(36.3)	31(19.4)	89(27.8)	6.4	1.9
6 – 10	102(63.7)	129(80.6)	231(72.2)		
Farming status					
Full-time	130(81.3)	153(95.6)	283(88.4)		
Part-time	30(18.7)	07(4.4)	37(11.6)		

Source: Field Survey, 2017. Values in parenthesis are percentages

Membership of Associations

The results in Figure 1 showed that 66.6% of the respondents were members of Cooperatives Association, 23.4% were members of FADAMA Group and 10% belonged to Rice Farmers Association (RIFAN) in the sampled states. In Ogun State, the higher proportion of the respondents (83.2%) was members of Cooperatives Association while it was 50% in Niger State. But, the proportion of the respondents that participated in FADAMA Group was higher in Niger State (42.5%) as against 4.4% in Ogun State. The implication is that the respondents belonged to one association or the other. Similar finding was reported by Omoare, (2015) in a study conducted on Ofada Rice Sustenance at Obafemi Owode Local Government Area of Ogun State, Nigeria. Abiona (2010) pointed out the importance of group networking in adoption of various technologies. The relevance of membership of association for this study came from the fact that these different associations are one of the possible avenues of mobilizing farmers for collective action.
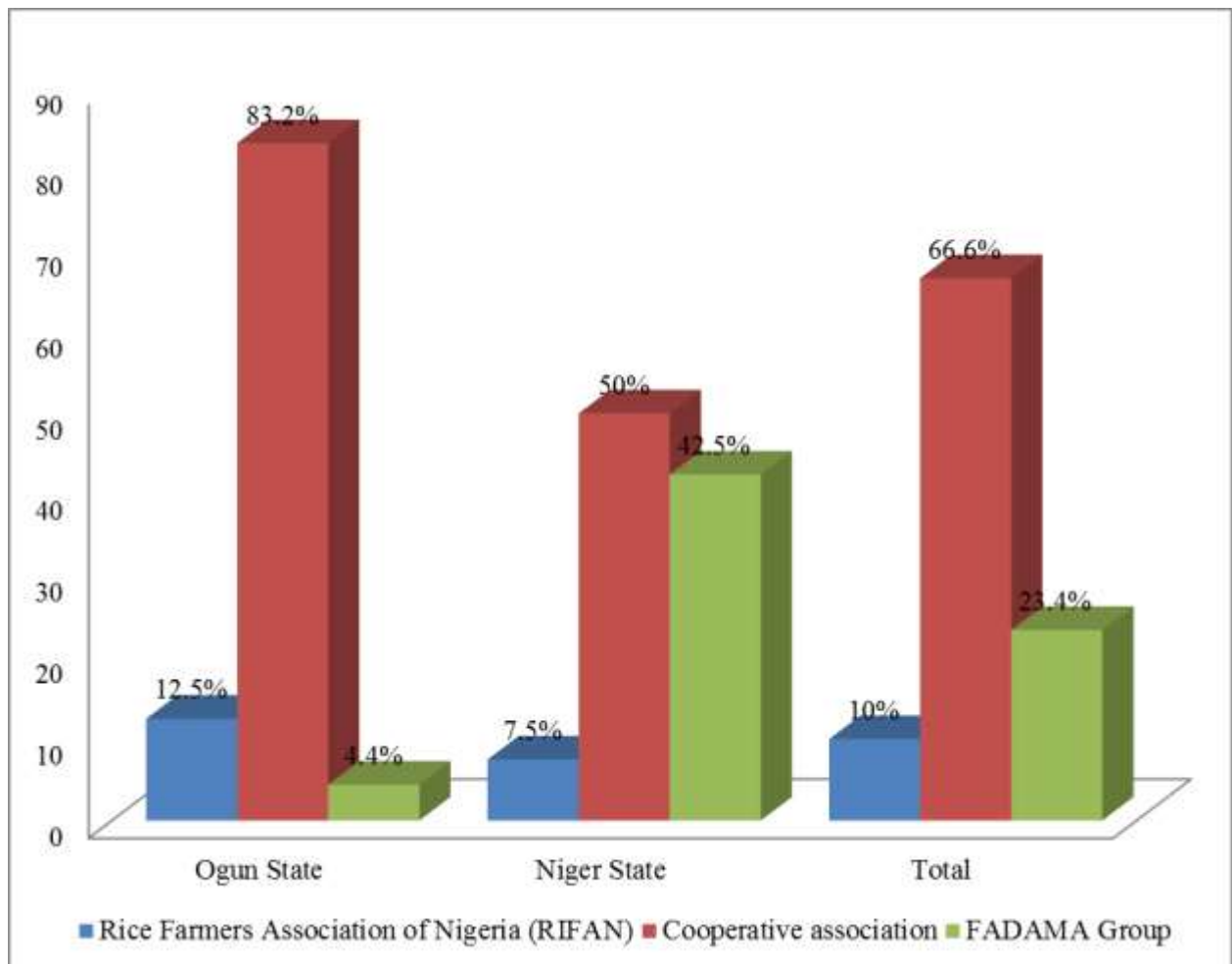

Figure 1: Histogram showing distribution according to membership of association

Source: Field Survey, 2017. *multiple responses recorded

Production pattern for Rice

Results in Table 2 showed that 35.9% of the respondents carried out soil test across the sampled states, out of which Niger State had the higher proportion of the respondents (60%) that did soil test compared to Ogun State (11.9%). The higher proportion in Niger State is attributed to the location of National Cereal Research Institute (NCRI) Badeggi in the state. Most (90%) of the respondents raised field nursery for rice across the sampled states, of which 93.8% in Niger State cultivated rice on field nursery and 86.3% in Ogun State planted rice on field nursery. About 55% of the respondents used tractor for land clearing in the sampled states while the remaining 45% used manual method for land clearing. In Niger State, most (83.8%) of the respondents used tractor to clear land compared to 26.2% in Ogun State. It implies that most of the respondents in Niger State raised rice on field nursery and used tractor compared to Ogun State. According to Adeosun and Oniyibe, (2005), proper land preparation is necessary in rice production to minimize competition with weeds, enhances adequate mixture of stubbles and fertilizer as well as ensures uniform water distribution. Majority (64.4%) of the respondents spent more than ₦61,000/ha across the sampled states with 70% in Niger State spending ₦61,000/ha as against 58.8% in Ogun State that spent similar amount on land preparation. It indicates that respondents in Niger State spent higher amount on land preparation than those from Ogun State. Meanwhile, 25.3% spent ₦41,000 – 60,000/ha while 10.3% spent ₦21,000 – 40,000/ha. About sixty percent (59.1%) of the respondents spent ₦3,000 – 5,000/ha across the sampled states. Ogun State had the higher proportion (61.2%) of respondents that spent ₦3,000 – 5,000/ha compared to Niger State. But, 40.9% spent more than ₦6,000/ha out of which Niger State had higher proportion (43.1%) compared to Ogun State (38.8%). Almost all (98.4%) the respondents soaked rice seeds in salt across the sampled states with 99.4% in Ogun State and 97.5% in Niger State. About 88.7% carried out seed dressing with chemicals with respondents from Niger State having the higher proportion (93.8%) compared to 83.8% in Ogun State. Chemical treatment is undertaken with a mixture of insecticide and fungicide such as 10g of Seed-plus of Dressforce to dress 2kg of seeds. Seed priming is conducted in order to hasten germination and crop emergence (Adeosun and Oniyibe, 2005). It is achieved by soaking the seeds in cold water for 12 hours or overnight and then drained which lead to higher percentage of viable seeds, vigorously established plants that can withstand stress and higher yields, increases resistance to insect pests and diseases and high paddy yield. Majority (88.7%) of the respondents planted more than 5.0kg/ha across the sampled states but Niger State had the higher proportion (55.6%) compared to Ogun State (34.4%). However, 65.6% in Ogun State planted 1.0 – 4.0kg/ha while 44.4% from Niger State planted the same quantity of rice seeds per hectare. More than seventy percent (71.6%) of the respondents spent ₦10,000 – 20,000/ha on fertilizer while 28.4% spent more than ₦21,000/ha across the sampled states. Broadcasting was the predominant method (84.4%) used for rice cultivation in the sampled states while 13.4% and 2.2% used dibbling and drill methods respectively. About 30.9% of the respondents used hired labour, 10.9% used family labour while 58.2% used both family and hired labour across the sampled states. Higher proportion of the respondents in Niger State (68.1%) used both family and hired labour compared to 48.1% in Ogun State. This shows that respondents in Niger State combined hired and family labour for rice value chain. This is in tandem with the previous findings of Oyediran (2016) on the rice processing among women in Ewekoro Local Government Area of Ogun State, Nigeria. The cost incurred on labour by 72.5% of the respondents was 50,000 – 80,000/ha while 27.5% spent more than ₦81,000/ha across the sampled states. Meanwhile 83.1% in Ogun State incurred higher cost on labour supply than in Niger State (61.9%).

Table 2: Distribution according to the rice production pattern

Production pattern	Ogun (n=160)	Niger (n=160)	Total (n=320)
Soil test			
Yes	19(11.9)	96(60.0)	115(35.9)
No	141(88.1)	64(40)	205(64.1)
Nursery			
Tray nursery	22(13.8)	10(6.2)	32(10.0)
Field nursery	138(86.3)	150(93.8)	288(90.0)
Land clearing			
Manual	118(73.8)	26(6.2)	144(45.0)
Tractor	42(26.2)	134(83.8)	176(55.0)
Cost of land preparation (₦/ha)			
21,000 – 40,000	18(11.2)	15(9.4)	33(10.3)
41,000 – 60,000	48 (30.0)	33(20.6)	81(25.3)
61,000 and above	94 (58.8)	112(70.0)	206 (64.4)
Cost of rice seeds purchased (₦/ha)			
3,000 – 5,000	98 (61.2)	91 (56.9)	189 (59.1)
6,000 and above	62 (38.8)	69 (43.1)	131 (40.9)
Seed treatment			
Soaking seed in salt	159(99.4)	156(97.5)	315(98.4)
seed dressing with chemicals e.g. Seed-plus	134(83.8)	150(93.8)	284(88.7)
Quantity of seed planted (kg/ha)			
1.0 – 4.0	105(65.6)	71(44.4)	176(55.0)
5.0 and above	55(34.4)	89(55.6)	284(88.7)
Cost of fertilizer (₦/ha)			
10,000 – 20,000	123(76.9)	106(66.3)	229(71.6)
21,000 and above	37(23.1)	54(33.7)	91(28.4)
Planting method			
Broadcasting method	141(88.1)	129(80.6)	270(84.4)
Dibbling method	17(10.6)	26(16.2)	43(13.4)
Drill method	0(0.0)	07(4.4)	07(2.2)
Farm Labour Services			
Hired labour	68(42.5)	31(19.4)	99(30.9)
Family labour	14(8.7)	21(13.1)	35(10.9)
Hired & family labour	77(48.1)	109(68.1)	186(58.2)
Cost of labour (₦/ha)			
50,000 – 80,000	133(83.1)	99(61.9)	232(72.5)
81,000 and above	27(16.9)	61(38.1)	88(27.5)

Source: Field Survey, 2017. Values in parenthesis are percentages

*multiple responses recorded

Processing Systems

Results in Table 3 showed that mechanical methods were used for threshing (63.4%) and winnowing (38.4%) of the rice across the sampled states. Apart from mechanical milling other processing operations such as drying, parboiling and drying after parboiling, de-stoning, polishing, grading, sorting and packing were carried out manually. Studies of Omoare (2015)

and Oyediran (2016) affirmed these findings that traditional methods of processing rice are still predominant in the rural areas of Ogun State, Nigeria.

Table 3: Distribution according to processing systems

Processing techniques	Ogun (n = 160)		Niger (n = 160)		Total (n = 320)	
	Manual	**Mechanical**	**Manual**	**Mechanical**	**Manual**	**Mechanical**
Threshing	63(39.4)	97(60.6)	54(33.8)	106(66.2)	117(36.6)	203(63.4)
Winnowing paddy	102(63.7)	58(36.3)	95(59.4)	65(40.6)	197(61.6)	123(38.4)
Drying	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)
Parboiling	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)
Drying after parboiling	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)
Milling	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)
De-stoning	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)
Polishing	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)
Grading	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)
Sorting	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)
Packing	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)

Source: Field Survey, 2017. Values in parenthesis are percentages

Rice Processing Facilities

The results in Table 4 revealed that 4.7% of the respondents indicated that paddy cleaner is available while all (100%) affirmed the availability of milling machines. Conversely, all (100%) the respondents indicated that essential rice processing facilities like electric rice parboiler, cice analyzer, broken rice analyzer, sifter, de-stoner and colour sorting were grossly lacking across the sampled states. It is an indication that the respondents predominantly used manual method for the rice processing. Akinwunmi (2013) reported the problem of low technology in Nigeria agricultural system and this has hampered the growth and development of this sector for economic transformation, employment and food security of the nation.

Table 4: Distribution according to rice processing facilities (n = 320)

Rice processing facilities	Available	Not available
Paddy cleaner	15(4.7)	305(95.3)
Electric rice parboiler	0(0.0)	320(100.0)
Milling machine	320(100.0)	0(0.0)
Rice analyzer	0(0.0)	320(100.0)
Broken rice analyzer	0(0.0)	320(100.0)
Sifter	0(0.0)	320(100.0)
De-stoner	0(0.0)	320(100.0)
Colour sorting	0(0.0)	320(100.0)

Source: Field Survey, 2017. Values in parenthesis are percentages

Rice Marketing Systems

Results in Table 5 revealed that most of the respondents took their rice to local market (98.3%) while 30.3% sold it at farm gate and 12.8% patronized urban market. Proportion of respondents that patronized local and urban markets in Ogun State was higher (61.2% and 15%) compared to Niger State (23.3% and 10.6%). But none of the respondents patronized

street market across the sampled states. Olukosi *et al*., (2007) expressed that the market for rice in Nigeria is not specialized and the rice value chain is under-developed; almost all of the paddy rice produced is marketed and utilized for local consumption. Paddy rice, local parboiled rice or imported rice is usually sold in the local markets. Furthermore, 5-day marketing was very common (72.2%) compared to weekly marketing (27.8%) in the sampled states. Respondents in Ogun State (83.1%) patronized 5-day marketing than those in Niger State (61.3%). However, in Niger State 38.8% of the respondents attended weekly marketing compared to 16.9% in Ogun State. In addition, *mudu/congo* (69.1%) was the common means of measuring rice in the sampled states but 30.9% used 50kg bags. Paddy rice is sold in jute bags which weigh between 50 and 120kg (Olukosi *et al*., 2007).

Table 5: Distribution according to rice marketing systems

Marketing system	Ogun (n = 160)	Niger (n = 160)	Total (n = 320)
Marketing point			
Farm gate	38(23.7)	59(36.9)	97(30.3)
Local market	98(61.2)	84(23.3)	182(98.3)
Urban market	24(15.0)	17(10.6)	41(12.8)
Street market	0(0.0)	0(0.0)	0(0.0)
Marketing days			
5-day marketing	133(83.1)	98(61.3)	231(72.2)
Weekly marketing	27(16.9)	62(38.8)	89(27.8)
Monthly marketing	0(0.0)	0(0.0)	0(0.0)
Measurement (kg)			
Mudu/congo (1.6kg)	129(80.6)	92(57.5)	221(69.1)
Bags (50kg)	31(19.4)	68(42.5)	99(30.9)
Weighing scale	0(0.0)	0(0.0)	0(0.0)

Source: Field Survey, 2017. Values in parenthesis are percentages

Rice Value addition

The results in Table 6 showed that value addition at production state was ₦350/kg in Ogun State and ₦280/kg in Niger State. At the processing stage the value added was estimated to ₦500/kg in Ogun State and 400/kg in Niger State. Value added at marketing stage was put at ₦750/kg in Ogun State and ₦550/kg in Niger State. It implies that the value addition increases from production to marketing stage across the sample states but Ogun State recorded higher increment throughout the rice value chain. This could be attributed to the proximity of Ogun State to Lagos State which is commercial hub of Nigeria. Also, these results showed that marketing stage has the highest margin which is an indication of increased earnings from value addition at marketing stage compared to least earning at production. This is a pointer to the reason why rural rice farmers that sell their rice at farm gate earn less hence, remains poor. Value addition to rice is very important at this point to help the rural poor farmers out of poverty.

Table 6: Distribution according to Rice Value addition

Value addition	Ogun (n = 160)	Niger (n = 160)
Value added at production stage (₦/kg)	350.00	280.00
Value added at processing stage (₦/kg)	500.00	400.00
Value added marketing stage (₦/kg)	750.00	550.00

Source: Field Survey, 2017

Constraints to Rice Value Chain

There are several challenges to rice value chain in Nigeria among which were birds' disturbance (96.6%), high cost of processing equipment (92.5%), inadequate finance (83.1%) and lack of rural infrastructure (82.8%) and were accordingly ranked by the respondents as 1st, 2nd, 3rd and 4th respectively. Low technology base (mechanization), decaying infrastructure, high interest rates are major impediments to agricultural sector in Nigeria (Akinwunmi, 2013). Respondents in Niger State had the higher rate of birds' disturbance (98.7%) compared to Ogun State (94.4%). The burden of finance and cost of processing equipment were also higher in Niger State (84.4% and 93.9%) than Ogun State (81.9% and 91.3%). Paradoxically, Pest and diseases incidence was higher in Ogun State (86.3%) because of high relative humidity compared to Niger State (76.3%). Similarly, effects of climate change and land tenure system were more serious in Ogun State (80.6% and 87.5%) than Niger State (78.1% and 67.5%). Other major constraints identified were land degradation and poor soil fertility (65.3%), inadequate agricultural extension support on training and capacity building (75.9%), poor market system (69.4%), incidence of fire outbreak (65.3%) and non-availability of quality seeds and agro-chemicals (64.4%). These results corroborate the position of Akinwunmi (2013) on the challenges facing agricultural sector in Nigeria.

Table 7: Distribution according to constraints to rice value chain

Constraints	Ogun (n=160)	Niger (n=160)	Total (n=320)	Rank
Inadequate finance	131(81.9)	135(84.4)	266(83.1)	3rd
Pest and diseases incidence	138(86.3)	122(76.3)	260(81.2)	5th
Climate change	129(80.6)	125(78.1)	254(79.4)	6th
Land tenure problem	140(87.5)	108(67.5)	248(77.5)	7th
Incidence of fire outbreak	91(56.9)	118(73.8)	209(65.3)	11th
Birds disturbance	151(94.4)	158(98.7)	309(96.6)	1st
Land degradation and poor soil fertility	115(71.9)	129(80.6)	244(76.3)	8th
Non-availability of quality seeds and agro-chemicals	100(62.5)	106(66.3)	206(64.4)	12th
Lack of rural infrastructure	125(78.1)	140(87.5)	265(82.8)	4th
Inadequate agricultural extension support on training and capacity building	144(90.0)	99(61.8)	243(75.9)	9th
High cost of processing equipment	146(91.3)	150(93.8)	296(92.5)	2nd
Poor market system	105(65.6)	117(73.1)	222(69.4)	10th

Source: Field Survey, 2017. Values in parenthesis are percentages

*multiple responses recorded

Relationship between selected socio-economic characteristics of the respondents and Rice Value Addition

The results of chi-square analysis in Table 8 showed that age (χ^2 = 24.16, df = 2, p = 0.01) was significant to the rice value addition at $p < 0.05$ level of significance. The value addition was low across the age strata in the sampled states at $p < 0.05$ level of significance. The low value addition among respondents in the age bracket 31 – 40 years in Ogun State was 61.9% while it was 66.3% in Niger State indicating that Niger State has the higher low value addition in the rice value chain. It means that the low value addition of the respondents is influenced by age. The older the rice farmers the lesser the low value addition. Relationship existed between gender (χ^2 = 11.93, df = 1, p = 0.00) and rice value addition at $p < 0.05$ level of significance. Female are tend to carry out value addition than their counterpart male. Educational attainment (χ^2 = 17.22, df = 3, p = 0.00) was significant to the rice value addition at $p < 0.05$ level of significance. About 32.8% of the respondents in the secondary school category had low value addition as against 10.6% in the tertiary school category that had low value addition; value addition was low among respondents with primary education in Ogun State (13.1%) compared to the higher proportion (48.1%) in Niger State. This means that educational status had influence on value addition. Also, farmers' monthly income (χ^2 = 23.51, df = 3, p = 0.02) was significant to the rice value addition at $p < 0.05$ level of significance across the various income categories. As the famers' income reduces the value addition reduces. About 25% in the income category 401,000 – 500,000/ha in Ogun State had low value addition compared to 21.9% in Niger State. Meanwhile farming status (χ^2 = 0.92, df = 1, p = 0.07) was not significant to the rice value addition at $p < 0.05$ level of significance. Most (88.4%) of the respondents in full-time status had high value addition compared to 11.6% in the part-time category. Significant association was found between years of experience and the rice value addition (χ^2 = 29.21, df = 2, p = 0.01) at $p < 0.05$ level of significance with 61.9% of 21 years and above having high value addition, 57.5% in Niger State and 49.4% in Ogun State. It is an indication that the higher the experience the more the tendency of rice farmers going into value addition. Finally, there was significant relationship between farm size (χ^2 = 16.03, df = 1, p = 0.01) and the rice value addition at $p < 0.05$ level of significance. Low farm size is attributed to low level of value addition. The significant of selected socio-economic variables could be attributed to the fact that age, gender, educational attainment, monthly, experience, farming status and farm size has direct influence on rice value addition in the sampled states. Therefore, the null hypothesis that *"there is no significant relationship between socio-economic characteristics of the respondents and value addition"* is rejected.

Table 8: Relationship between selected socio-economic characteristics of the respondents and rice value addition

Socio-economic characteristics	Ogun (n = 160)		Niger (n = 160)		Total(n=320)		χ^2	df	p-value	Decision
	High	Low	High	Low	High	Low				
Age (years)										
31 – 40	61(38.1)	99(61.9)	54(33.7)	106(66.3)	55(7.2)	265(82.8)	24.16	2	0.01	Significant
41 – 50	49(30.6)	111(69.4)	45(28.1)	115(71.9)	34(10.6)	286(89.4)				
51 and above	38(23.8)	122(76.2)	40(25)	120(75.0)	18(5.6)	302(94.4)				
Gender										
Male	27(16.9)	105(65.6)	15(9.4)	110(68.8)	42(13.1)	215(67.2)	11.93	1	0.00	Significant
Female	10(6.3)	18(11.2)	13(8.1)	23(14.4)	23(7.2)	41(12.8)				
Educational attainment										
No formal education	0(0.0)	18(11.2)	42(26.3)	02(1.3)	42(13.1)	20(6.3)	17.22	3	0.00	Significant
Primary education	21(13.1)	65(40.6)	77(48.1)	40(25.0)	98(26.6)	105(32.8)				
Secondary education	15(9.4)	74(46.3)	45(28.1)	29(18.1)	60(18.7)	103(32.2)				
Tertiary education	07(4.4)	33(20.6)	18(11.2)	01(0.6)	25(7.8)	34(10.6)				
Farmers' monthly income (₦)										
300,000 – 400,000	47(29.4)	09(12.3)	24(15.0)	0(0.0)	71(22.2)	14(6.2)	23.51	3	0.02	Significant
401,000 – 500,000	40(25.0)	20(27.4)	35(21.9)	08(8.1)	75(23.4)	45(19.9)				
501,000 – 600,000	23(31.5)	32(20.0)	28(28.3)	37(23.1)	51(15.9)	69(21.6)				
601,000 and above	41(25.6)	21(28.8)	64(40.0)	63(63.6)	105(32.8)	100(44.2)				
Farming status										
Full-time	130(81.3)	50(68.5)	153(95.6)	77(77.8)	283(88.4)	152(67.3)	0.92	1	0.07	Not significant
Part-time	30(18.7)	20(27.4)	07(4.4)	12(12.1)	37(11.6)	52(23.0)				
Years of experience										
Less than or equal 10	20(12.5)	02(2.7)	12(7.5)	10(40.4)	32(10.0)	22(9.7)	29.21	2	0.01	Significant
11 – 20	61(38.1)	61(83.6)	56(35.0)	40(40.4)	117(36.6)	64(28.3)				
21 and above	79(49.4)	10(13.7)	92(57.5)	49(49.5)	171(53.4)	140(61.9)				
Farm size (ha)										
Less than 5	58(36.3)	53(72.6)	31(19.4)	86(86.9)	89(27.8)	190(84.1)	16.03	1	0.01	Significant
6 – 10	102(63.7)	20(27.4)	129(80.6)	13(13.1)	231(72.2)	36(15.9)				

Source: Field Survey, 2017. df – degree of freedom; S - Significant at p < 0.05 level of significance; NS - Not Significant at p > 0.05 level of significance

Values in parenthesis are percentages

Relationship between Processing Techniques and Rice Value Addition

The results of chi-square analysis in Table 9 showed that significant relationship existed between threshing (χ^2 = 8.35, df = 1, p = 0.00) and rice value addition at p < 0.05 level of significance. About 63.4% had high value addition in the sampled states but Niger State (66.2%) had the higher proportion compared to Ogun State (60.6%). Milling was also found to be significant (χ^2 = 12.92, df = 1, p = 0.02) to the rice value addition at p < 0.05 level of significance and the significant cut across all the respondents in the sampled states. The outcome of these results could be as a result of the fact that the respondents used mechanical methods for the threshing and milling of the harvested paddy rice in the study areas. However, winnowing (χ^2 = 1.59, df = 1, p = 0.12), drying (χ^2 = 0.67, df = 1, p = 0.08), parboiling (χ^2 = 0.83, df = 1, p = 0.15), de-stoning (χ^2 = 1.35, df = 1, p = 0.09), polishing (χ^2 = 1.56, df = 1, p = 0.18), grading (χ^2 = 1.22, df = 1, p = 0.21), sorting (χ^2 = 0.81, df = 1, p = 0.27) and packing (χ^2 = 0.05, df = 1, p = 0.32) were not significant to rice value addition at p < 0.05 level of significance across the sampled states. These results are attributed to manual methods being used for rice processing operations in the study areas. Therefore, the null

hypothesis that "*there are no significant relationships between processing techniques and rice value addition*" is accepted.

Table 9: Relationship between Processing Techniques and Rice Value Addition

Processing techniques	Rice value addition						χ^2	df	p-value	Decision
	Ogun (n = 160)		Niger (n = 160)		Total (n = 320)					
	High	Low	High	Low	High	Low				
Threshing	97(60.6)	63(39.4)	106(66.2)	54(33.8)	203(63.4)	117(36.6)	8.35	1	0.00	Significant
Winnowing paddy	58(36.3)	102(63.7)	65(40.6)	95(59.4)	123(38.4)	197(61.6)	1.59	1	0.12	Not significant
Drying	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0.67	1	0.08	Not significant
Parboiling	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0.83	1	0.15	Not significant
Drying after parboiling	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	2.32	1	0.06	Not significant
Milling	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0(0.0)	12.92	1	0.02	Significant
De-stoning	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	1.35	1	0.09	Not significant
Polishing	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	1.56	1	0.18	Not significant
Grading	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	1.22	1	0.21	Not significant
Sorting	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0.81	1	0.27	Not significant
Packing	0(0.0)	160(100.0)	0(0.0)	160(100.0)	0(0.0)	320(100.0)	0.05	1	0.32	Not significant

Source: Field Survey, 2017. df – degree of freedom; S - Significant at $p < 0.05$ level of significance; NS - Not Significant at $p > 0.05$ level of significance

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the findings of this study, it was established that:

Above forty percent of the respondents were between 30 – 40 years of age which indicate economic active age group, predominantly male, married, had relatively large household size and formal education. Average income generated was estimated as ₦551,250/ha. They were member of RIFAN, Cooperative societies and FADAMA. More respondents carried out soil test and used tractor for land clearing in Niger State than in Ogun State. Rice seeds were mostly planted on the field nursery rather than tray nursery. Hired and family labour was used for rice value chain in the two sampled states. Operations in the rice processing were carried out manually due to non-availability of basic rice processing facilities. Marketing of rice was usually at local markets at interval of 5-day marketing and *mudu/congo* was the item used for measurement in the market. The returns of value addition were higher at marketing stage than production stage. Birds' disturbance, high cost of processing equipment, inadequate finance and lack of rural infrastructure were the major constraints to rice value chain in the sampled states. Chi- square analysis shows that there is significant relationship between socio-economic characteristics of the respondents and value addition at $p < 0.05$ level of significance. Similarly, significant relationship existed between threshing and rice value addition at $p < 0.05$ level of significance.

RECOMMENDATIONS

The study recommends that:

1. the rice farmers should embark on value addition to enhance their income from rice production;

2. the rice farmers should approach commercial banks for loans to expand their farms and purchase rice processing equipment through their association;

3. government should provide basic rural infrastructure like good road, electricity supply, portable etc. that can promote rice value chain and agricultural development in the sampled states and Nigeria at large;

4. agricultural extension services should expedite action by organizing training that can facilitate increased rice production and value addition in the study areas;

5. international donors should come to the aid of rice farmers in the area of birds and disease control as well as rural financing in the study areas.

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